

..... an event for 50<sup>th</sup> Anniversary of Sriwijaya University  
World Water Day 2010 – March 22

**INTERNATIONAL SEMINAR-WORKSHOP ON**  
**"INTEGRATED LOWLAND DEVELOPMENT & MANAGEMENT"**  
**PALEMBANG CITY – BANYUASIN DISTRICT SOUTH SUMATERA INDONESIA**  
**MARCH 18-20, 2010**

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Palembang, March 11, 2010

No : 086/ Pospel-HAS/03/2010  
Subject : Invitation for Paper Presentation on International for Seminar-Workshop  
Integrated Lowland Development and Management, March 18-20, 2010

TO. YETTY HASTIANA

**Author of Paper for  
The International Seminar-Workshop**

We would like to inform you about presentation of your paper on the above Seminar-Workshop such as:

- There are more than 50 papers submitted for our Seminar – Workshop;
- Presentation of your paper is in English for 15 minutes (10 minutes presentation and 5 minutes for Question and Answer); There will be 4 (for) parallel rooms for the presentation.
- All seminar kits, guidelines, presentation schedule etc., will be given at the Pascasarjana University Seminar-Workshop registration desk Room P01;
- The registration will take place at Room P01 on Thursday, March 18, 2010 starting 12.30 , and the presentation will start on 13.30 until 17.30 at the same day;
- If you do not present your paper according to our guidelines, We will not be able to publish the paper on the proceeding.

We are thanking you for your active participation on the Seminar-Workshop, and wish you all the best in your presentation.

Best regards,  
Chairman of the Organizing Committee



Dr. Robiyanto Hendro Susanto

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Integrated Lowland Development and Management  
Palembang – Banyuasin, South Sumatra  
March 18-20, 2010**

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3	1. Sara Kaffashi 2. Mad Nasir Shamsudin 3. Mandana Yavari	1. Faculty of Environmental Studies, University Putra Malaysia, 43300 UPM Serdang, Selangore D.E., Malaysia 2. Department of Environmental Management, Islamic Azad University, Science and Research Branch, Tehran, Iran	Sustainable Land use Planning of Lowland Zone for Agriculture Activity	Pesrta/ Pemakalah
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4	Asmarhansyah	Central Kalimantan Assessment Institute for Agricultural Technology <a href="mailto:asmarhansyah@gmail.com">asmarhansyah@gmail.com</a>	Implementation Of Integrated Crop Management Of Rice In Tidal Swamp Area, Central Kalimantan	Pesrta/ Pemakalah



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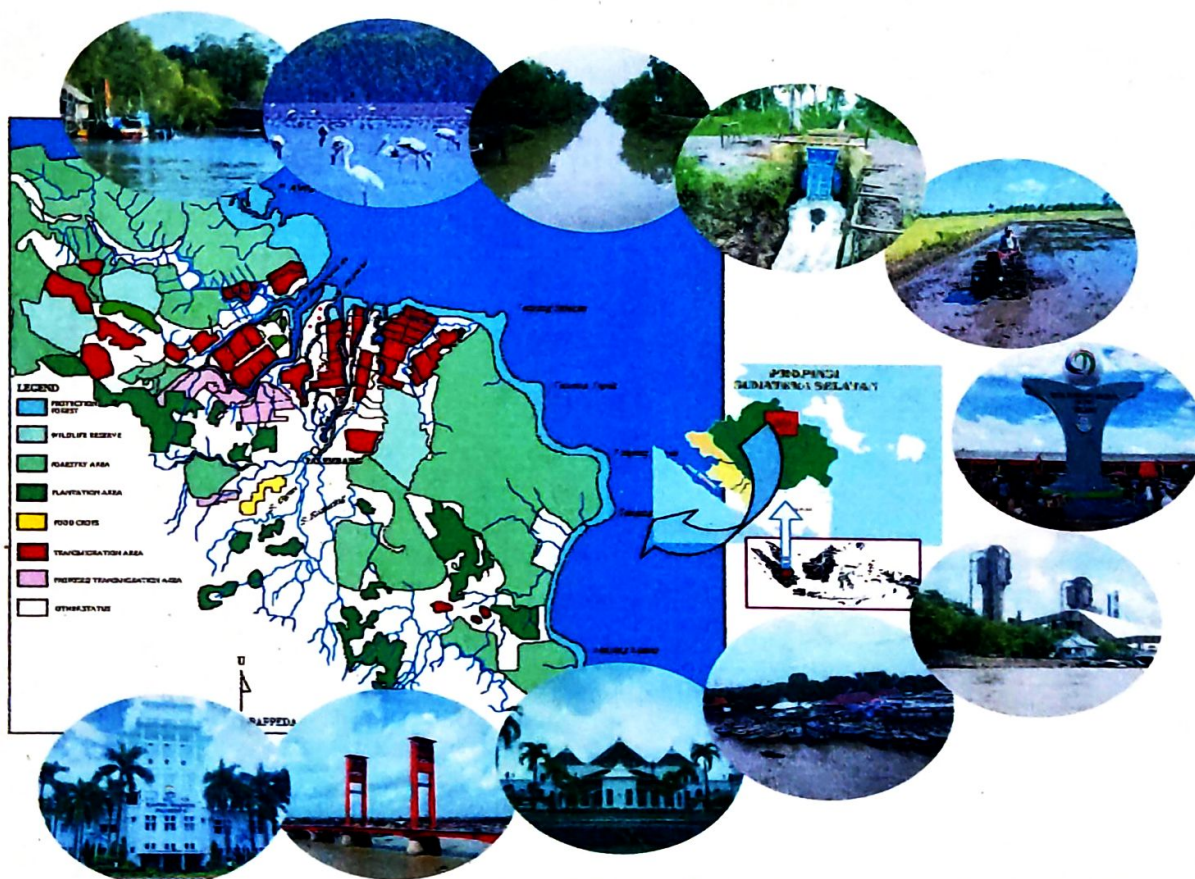
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## Proceedings

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#### THEME:

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MULTISTAKEHOLDERS PARTICIPATION ON THE SUSTAINABILITY OF  
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PALEMBANG CITY – BANYUASIN DISTRICT  
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## FOREWORD

Lowland areas consist of swampy areas, wetlands, coastal areas, saturated and high water table areas in the sides of rivers or estuaries.

Hydrologically these lowland areas are defined as upland swamps (lebak) when the high water table condition is affected only by the rainfall and the surface run off in the watershed. On the other end, it is named tidal lowlands when affected by the tidal movement, either directly or indirectly interact with the river flow. Mineral soil, deposited sediment, or peat are material which formed the land with these high water table condition. Mega biodiversity within the wetlands and coastal areas are of concern in the management and development of lowlands.

Some suitable lowlands areas are developed for living of the people since hundreds of years ago, ie. Bugineese, Banjarees people development for paddy field and aquaculture system. This community based development triggered the government of Indonesia since 1969 to develop a transmigration program for food crops production. Estate crops development mostly by the private sector - agro industry based development - has started to work on the lowlands.

If we look on different perspectives, both conservation and development of the lowlands should be considered. Integrated lowland development and management is one of the key issues need to be addressed.

International Seminar-Workshop is theme The Role of Agro-Eco-Edu Program through Multistakeholders Participation on the Sustainability of Lowland Development and Management. International Participants are from Netherlands, Thailand, Malaysia.

International Seminar and Workshop committees wish to gratefully acknowledge the support extended by the Sponsors. Committees are also indebted to all those who have kindly helped in the preparation of these proceedings and deeply grateful to the Authors, for their valuable contributions in the form of papers.

Palembang, South Sumatra, Indonesia, March, 2010  
Chairman of the Organizing Committee



Dr. Robiyanto Hendro Susanto, M.Agr.Sc



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**CONSERVATION OF MANGROVE ECOSYSTEM AS ALTERNATIVE FOR GLOBAL WARMING  
ADAPTATION IN ESTUARINE AREA AND COASTAL LOWLAND  
(Study Management of Mangrove Ecosystem on Coastal-Lowlands, Coastal Area of  
East Sumatera, Banyuasin, SumSel)**

**Yetty Hastiana<sup>1)</sup>, Fachrurrozie Sjarkowi<sup>2)</sup>, Dinar Putranto<sup>2)</sup>, Rasjid Ridho<sup>2)</sup>**

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**ABSTRACT**

Mangrove Ecosystem known as energy substitution, mangrove potency offering benefit, causing its existence is silent the than ruining. Lowlands Coastal is potential land type to be developed, but in its development need global effect. Lowlands represent ecosystem of most degradation, its cause extended by natural factor of human being factor. On some area, degradation cause increase of sea water face (as global warming effect), sediment and change of pattern hydrology. Indonesia is included in area in Asia Pacific having lowland with high mangrove ecosystem biodiversity, one of them reside in South Sumatra. Though some of Sembilang area, Sumsel have the included in conservation area, but pressure to this area increasing. One of its activity form for example: use result of fast change and forest displace forest function become: conducting farm, fishpond, industrial area, infrastructure development (port); development of coastal area town (city coastal). Change of mangrove ecosystem to progressively increase by effect global warming in the form: increase sea water face, change tidal pattern. Change of mangrove ecosystem influence ecosystem balance, in global scale affect to totally disappeared of biodiversity aquatic, finally affect to life of society. See possibility of appearance various conflict, require to be studied by anticipatory management of exploitation level. Alternative Management of mangrove to develop concept management of have continuation to with vision of environment. The concept is show exploiting modification by giving advantage of continue, while nature like food net and ecological process remain to be looked after. New paradigm in management of resource developed to through approach entangle recognized local society with "community development".

**Key Words:** coastal lowland, estuarine, global warming effect, mangrove ecosystem.

**INTRODUCTION**

Indonesia consist of 17.508 island broadly continent 191.931.900 territorial water and Indonesia consist of 17.508 island broadly continent 191.931.900 territorial water and km 500 million ha, lay in tropical climate have properties wide of biodiversity of high mangrove forest. Wide of continent, about 143,7 ha (74,8%) representing forested area, for example there are coastal alongside and river estuarine. Wide of coastal area mangrove forest 4,251 million ha with especial spreading area in East Sumatra coast, river estuarine in Kalbar and Kaltim, Sulawesi and Irian Jaya <sup>(1) (2)</sup>. Wide of mangrove forest which remain only 2,6 million ha <sup>(20)</sup>.



Mangrove as ecosystem defined as zone between tide and supra from muddy coast in bay, lake and estuarine, which predominated halofit wood which is high adaptation and related to water path which continue (river), and bog (backwater) together with flora population and fauna in it. In place which there is no river estuarine and delta which its rather flimsy. On the contrary, in place having great of river estuarine and delta which its current containing many sand and mud, usually its grow to extend <sup>(4)(5)</sup>. Mangrove is productive ecosystem in world especially in tropic area, good in primary productivity and also serasah fallout productivity. High Mangrove productivity directly related to enchaining food through converged energy stream or relied on serasah fallout and detritus. Fertility of territorial water of this mangrove making it as area which visited many animal and contribute nutrient to coastal territorial water closest <sup>(4)</sup>.

Mangrove represent as plant able to live adaptation with tide area or brackish bog with condition of extreme (high salt rate, wind blowing, wave blowing, lacking of oxygen/anaerobic, and substrate which vary). Mangrove habitat has condition of special environment and condition of land which vary between mud, clay, sand and peat <sup>(5)(18)</sup>. To adapt with this condition of mangrove have to be designed unique root system. Mangrove root have some of blown to atmosphere with a few kinds of form as according to its type. High Salt rate from sea also earn adaptation by this crop with filtration character at conducive leaf structure and also root of this crop permeate water without salt and also permeate water go out to sea to have salt and release salt through leaf <sup>(1)(5)</sup>. Nature of typically is other the mangrove is to have ability neutralize contaminant waste especially heavy metal like mercury, cadmium, zinc and lead <sup>(2)(4)</sup>.

Besides structure and nature of unique mangrove, mangrove forest have ecological function very the necessary for coastal ecosystem, especially as growth factor for coastal territorial aquatic, place reproductive of territorial aquatic biota, regional protection of coastal area from eroding, pursuing sea water intrusion, neutralizing contaminant waste, and sea water filtration <sup>(2)</sup>. Mangrove forest have multi function <sup>(4)(5)(16)</sup>, that is ecological function, for example: reproductive place or multiply, foraging, haven various aquatic biota (prawn, crab, oyster, fish) both for larva level till adult; preventing water intrusion go out to sea to continent; preventing contamination; place precipitation of mud; protecting from wind. As social function of economics, representing fish capture area, prawn, firewood source and crab, charcoal, tanin, tanner materials and pulp raw material <sup>(11)</sup>. Some research show the existence of correlation between fishery product catch broadly mangrove forest <sup>(16)(17)(18)</sup>.

Wetland represented natural resources to become development target. Wet land of lowlands coastal is potential low land type to be developed, but in development require to considering environmental and global effect. Tide area is one of the lowland type in Indonesia. Estuarine come from aetus word with the meaning tide area, defined as body irrigate in coastal region, related to high seas. Ecosystem very influenced by sea water (low tide) and sea water mixed with land water causing its of lower salt content <sup>(18)</sup>.

Type habitat and vegetation tide area South Sumatera influenced by estuarine system. Vegetation in this area is predominated by mangrove forest with land continent and sand and also a number delta. In upstream of DAS Banyuasin, ecosystem have a form of brackish bog (rawa payau) and freshwater bog (rawa air tawar). Mangrove as ecosystem defined as zone between tidal (pasut) and up tidal (supra) from muddy coast in bay, lake (brackish water) and estuarine <sup>(3)(19)</sup>.

Estuarine Ecosystem with mangrove vegetation is recognized very productive, but sensitive to trouble. This regional is very dynamic and every moment happened change of coverage. Various organism earn life ably adaptation to environmental fluctuation. With owned potency it, mangrove ecosystem offer so much benefit so that its existence in nature do not is silent than the mutilation and destruction <sup>(19)</sup>.



Low land represent most ecosystem of degradation and predicted have loss equal to 50% wide of genuine lowland in world <sup>(10)</sup>. Growth resident which high cause of land use change and lowland functional. The main problem degradation, specially lowland of coastal area is natural factor extended by human being factor. The main problem degradation at some area is increase of sea water face as global warming effect, sediment depression and change of hydrology. Quickly penetrating process of water sea to freshwater area yield change quality of environment, like change of tidal pattern to influence vegetations structure <sup>(6)</sup>. Pattern influence low tidal and increase of water out of condition also happened in South Sumatera east coast <sup>(10)</sup>. The Other side change of coastal area function for the settlement, urban development (city coastal), and fishpond progressively rapidly grow. If without use management will affect to change of mangrove ecosystem <sup>(20)</sup>. The increasing of activity of illegal logging at upriver, convert area for the embankment, industrial development and infrastructure development in area downstream progressively have contribution to change of mangrove ecosystem. Degradation of Mangrove to continue, degradation and deforestation cause of change mangrove composition <sup>(6)</sup>.

In this time happened degradation of fishery resources, factor quickening degradation is contamination height from continent and loss of upbringing area (mangrove). Aquaculture Development through deforestation threats continuity of biodiversity. Contamination Basin area threatened integrity of lowland ecosystem of coastal area, cause of the ecological diversity <sup>(2)</sup>.

Though in this time some of Sembilang area have the included in wetland conservation area in Indonesia, but pressure to this area progressively mount along with the increasing of depended society and also the increasing of society activity and accessibility around area. One the activity is making something beneficial result of forest; fast change displace forest function become; agroforestry farm, fishpond, industrial area, infrastructure development (for example port); coastal town area development. Change of ecosystem mangrove progressively to be cursed by global warming impact in the form of: increase of sea water face, change pattern of tidal will affect at change of composition, structure, level dominant of mangrove vegetation <sup>(3) (19)</sup>.

See possibility of appearance various conflict, require to be studied management to anticipate exploitation level. Damage of mangrove ecosystem besides affecting at is totally disappeared of vegetation cause at loss of habitat. At global scale is loss of wetland have an in with totally disappeared of various animal type and territorial aquatic biota. Animal and territorial aquatic biota have migration route remain to, altogether in the end affect at social life of society economics <sup>(1)</sup>.

Management alternative to anticipate mangrove exploitation is to develop management concept "sustainability and environmental development". Management oriented to improvement of economic social of society, despitefully mangrove forest also functions to sustain human life, either from ecology social and economic aspect. As step early in designing management of mangrove ecosystem in Banyuasin tidal area, will be identified and study to some problems, in the form of : (1) Condition and potency of mangrove ecosystem (structure and composition vegetation), (2) Factors is share to change of mangrove ecosystem (factor ecology, socio, economic), (3) Design management of appropriate mangrove ecosystem to be applied in Banyuasin tidal area, South Sumatera.



## EXPERIMENT RESEARCH

### a. Study Area (Area Sampling)

Study area cover: conservation area (Sembilang), and land use area (conducting settlement, etc) at mangrove ecosystem area in Banyuasin tide area at South Sumatera. Determination of area study determined also pursuant to research parameter, that is:

1. Determination of structure and composition mangrove vegetation use method analysis vegetation (ANVEG) <sup>(8)</sup> <sup>(9)</sup>. Area Perception divided to become four sample stations. Station I deputize area which still have thick mangrove vegetation far from settlement (conservation area); Station II deputize area owning thick mangrove vegetation but near to settlement. Station III resident deputize area owning a few vegetation far from settlement; Station IV deputize area which is scanty to be grow by vegetation but the near by settlement. Each station pretended transect, with length mark with lines transect vary according to is thick of green line (existence of mangrove).
2. Determination of water quality at two area which different. Water quality, such as: factor chemistry and physic.
3. Determination of social aspect of local society economics and culture done/conducted at two sampling area which different <sup>(13)</sup>. Sampling area I (station I) deputizing settlement of resident which near to conservation area (area owning thick mangrove vegetation); sampling area II (station I) deputizing settlement of resident residing in exploiting area (land use area).

### b. Data Collecting

Data character which required in this research include two data component, that is especial data (primary data) and supporter data (secondary data). Method secondary data collecting obtained from various literature study and reference various component. While primary data collecting method depend on accurate parameter aspect, like:

1. Observation ecological aspect -condition water quality and potency of mangrove ecosystem-, covering parameter: water quality (factor chemistry and physic), structure and composition mangrove <sup>(8)(9)</sup>.
2. Description Geographical aspect study area at Mangrove Area. Area study Descriptions by using intake of geographical information to Collected through survey research, digital with digitizer and edited with ARC/info from primary and secondary data, and then processed by using way of superimpose (overlay). Map Last to transfer to UTM form and editing with Arc View. Map orient study in scan later, then digital by using Arc View <sup>(3)</sup>.
3. Observation of aspect supporter potency and society condition: (1) characteristic condition of social cultural and society economics, (2) society participation and perception to management of Sembilang estuary area. Research social, economics and culture aspect to done by using method survey field. Collect of data done with direct observation and interview <sup>(13)</sup>.

### c. Analysis Data

1. Ecology Factor -Condition Water Quality; Structure and Composition Mangrove- Measuring to water quality in the form: COD, BOD, pH, water brightness, content water material, water flow fast.

Obtained data processed to know closing area, coverage wide, and frequency later on will be used to determine important value index. Important Value index (INP) can depict certain type dominant character and also association level mangrove vegetation community <sup>(9)</sup>.

2. Description Geographical Area Study at Mangrove Area



- Description area study by using intake of geographical information data from primary and secondary data, the processed by using way of superimpose (overlay). Collected map through moment survey research of digital with digitizer and edited with ARC / info, then in transfer to UTM form and edited with Arc View. Map study area in scan, then in digital by using Arc View (Hernandez, Rubi. *et al.* 2005)
3. Characteristic of Social Culture Potency and Evaluation Economic Potency Analysis characteristic social potency use statistical analysis <sup>(13)</sup>. Result of analysis social culture and economic aspect can use to analysis factors is share to change of mangrove ecosystem.

#### d. Framework Think and Design Activity Research

Coastal of East Sumatera, special conservation area, Sembilang Banyuasin represent area with natural resources and high biodiversity potency. This potency, there are opportunity to develop this area become conservation area and development area. But on the other side, some problems start to menace mangrove ecosystem balance which is on development effort and protection of mangrove ecosystem. Require anticipation to activity of meaning management of mangrove ecosystem which have been developed. Its resources (activity land use) with still take care to continue ecology balance at mangrove ecosystem (activity of conservation).

Alternatively do step early anticipatory effort to threat change of mangrove ecosystem by entangling a number of research and study. At this study will be conducted by a number of identifying and study to some problems which is prediction will menace to continue function of mangrove ecosystem as exploiting area and conservation area. Contribution and out put from this study is data base and recommendation of pattern development management mangrove ecosystem area. Description design of plan activity and framework research at mangrove ecosystem lowland, coastal area, Banyuasin presented at Figure 1. Description design of research contribution to management mangrove ecosystem lowland, coastal area, Banyuasin presented at Figure 2.

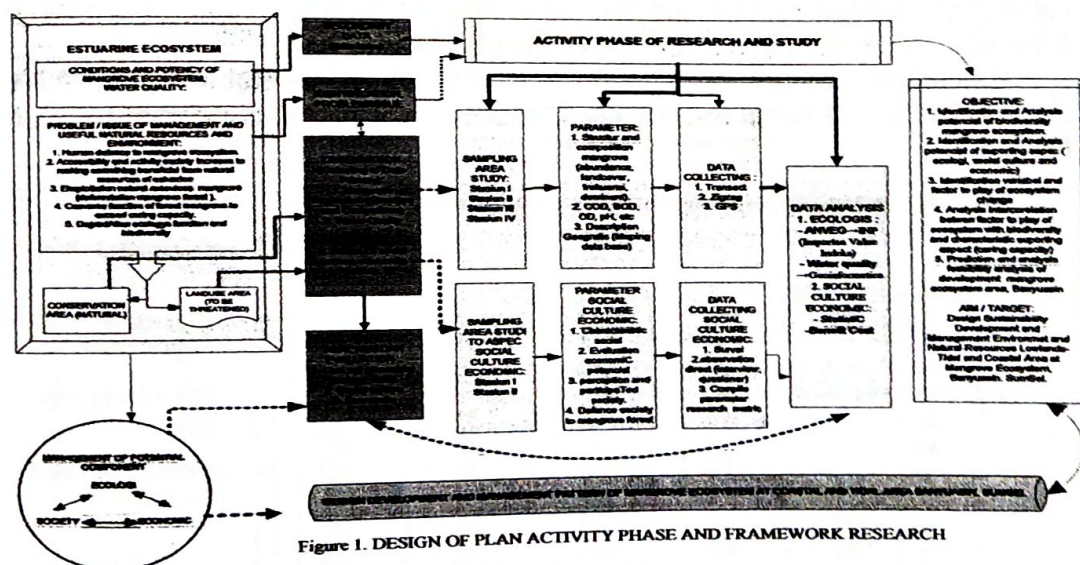


Figure 1. DESIGN OF PLAN ACTIVITY PHASE AND FRAMEWORK RESEARCH



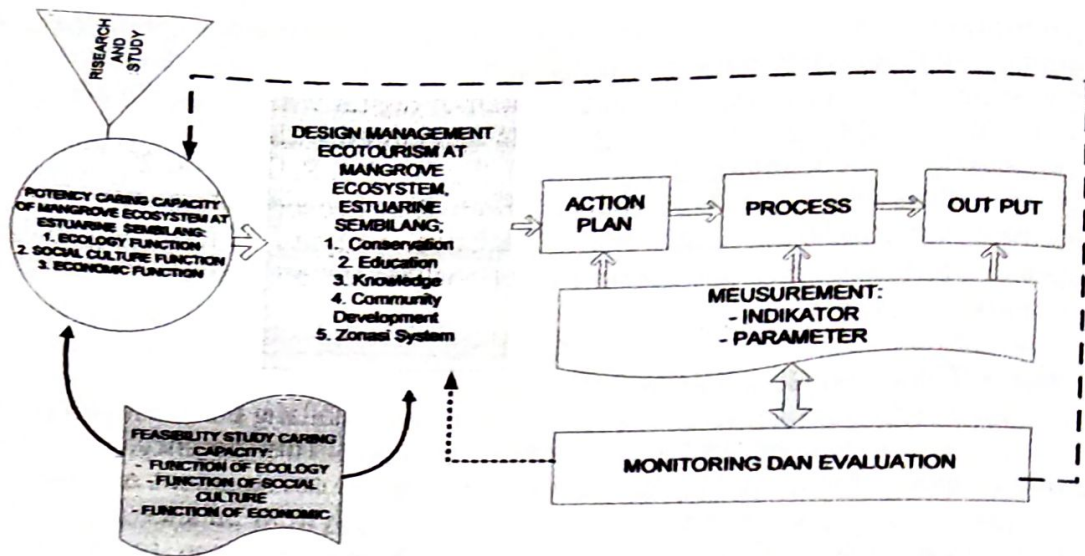


Figure 2. Research Contribution of Development and Sustainability Management Mangrove Ecosystem Lowland, Coastal Area Banyuasin, South Sumatera Indonesia

## RESULT AND DISCUSSION

Type habitat and vegetation tidal area South Sumatera influenced by estuarine system. Vegetation in this area is predominated by mangrove forest with land continen and sand and also a number delta. In upstream of DAS Banyuasin, ecosystems are form o brackish bog (rawa payau) and freshwater bog (rawa air tawar). Mangrove as ecosystem defined as zone between tidal (pasut) and up tidal (supra) from muddy coast in bay, lake (brackish water) and estuarine <sup>(3)(9)</sup>.

Pursuant to identifying and interpretation spatial data, area which getting tide influence most dominant cover some area, that is: area in DAS Banyuasin area and DAS Sembilang, specially Sub DAS Sugihan Kiri Barat, Musi Hilir and Banyuasin Hilir. DAS Banyuasin consisted of five Sub DAS area, that is: Sugihan, Musi Hilir, Musi Tengah, Banyuasin and Sembilang (Source: Spatial Data DAS Banyuasin, 2003) <sup>(3)(9)</sup>.

Condition and potency ecosystem mangrove at lowland-coastal area, in some sub district, District of Banyuasin District, Province of South Sumatera presented figure 3 to figure 7.

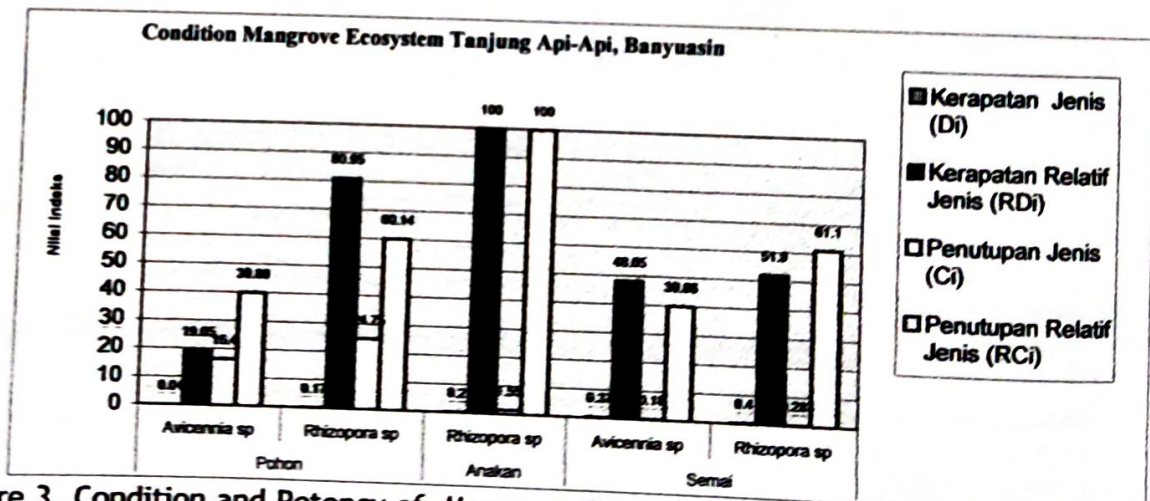


Figure 3. Condition and Potency of Mangrove Ecosystem, Tanjung Api-Api Lowland-Coastal Area, District Banyuasin, 2004. Source: BAPPEDA Banyuasin (secondary data) Hastiana, Sjarkowi, Putranto and Ridho. Conservation of Mangrove



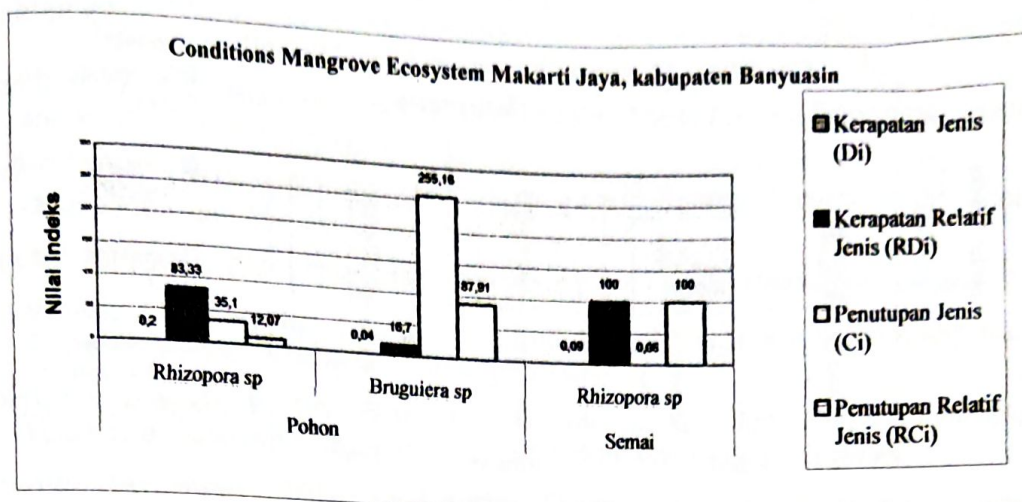


Figure 4. Condition and Potency of Mangrove Ecosystem, Makarti Jaya Lowland-Coastal Area, District Banyuasin, 2004. Source: BAPPEDA Banyuasin (secondary data)

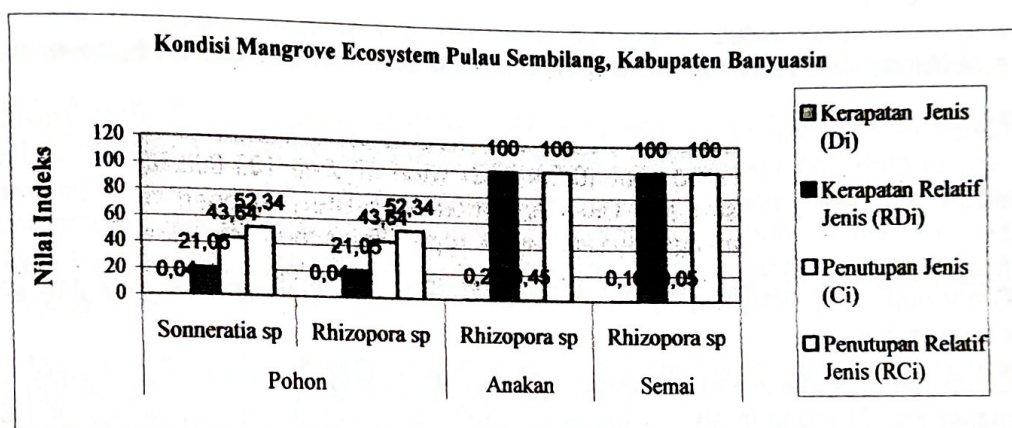


Figure 5. Condition and Potency of Mangrove Ecosystem, Sembilang Lowland-Coastal Area, District Banyuasin, 2004. Source: BAPPEDA Banyuasin (secondary data)

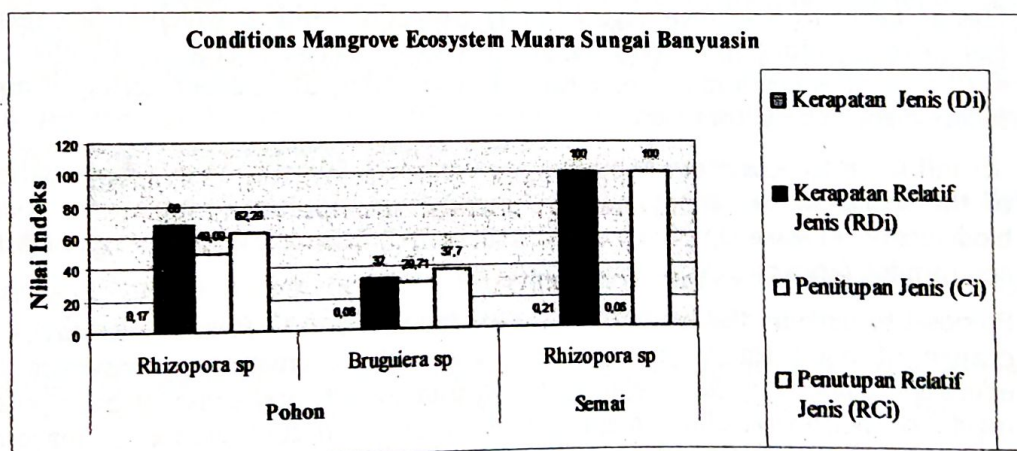


Figure 6. Condition and Potency of Mangrove Ecosystem, Muara Lowland-Coastal Area, District Banyuasin, 2004. Source: BAPPEDA Banyuasin (secondary data)



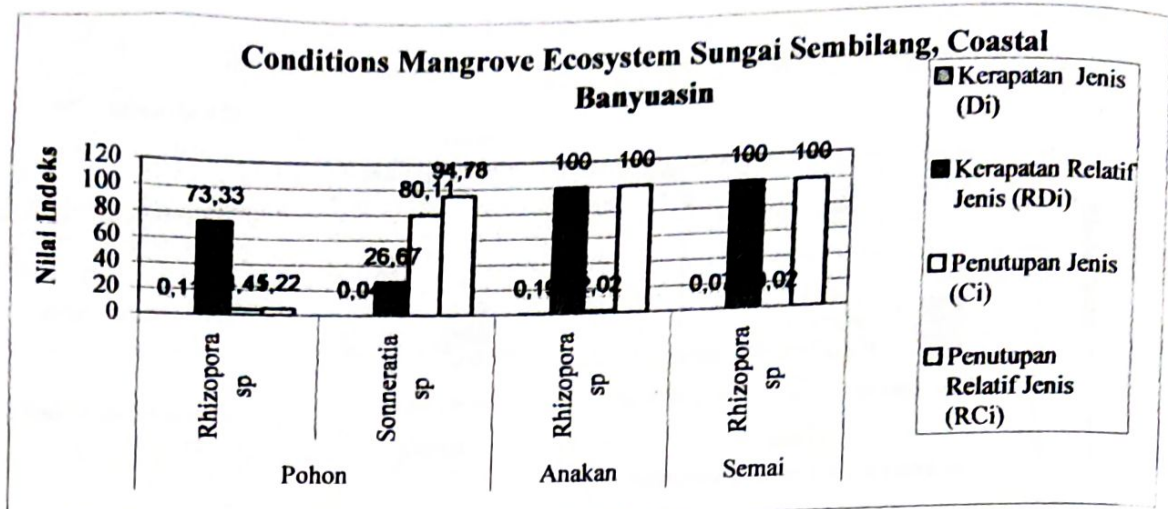


Figure 7. Condition and Potency of Mangrove Ecosystem, Sungai Sembilang Lowland-Coastal Area, District Banyuasin, 2004. Source: BAPPEDA Banyuasin (secondary data)

Several things able to be explored from progress result of this research, covering:

1. Condition of mangrove ecosystem at lowland area at South Sumatra: 1) grow at peat land in (3m) and shallow sand coat (0,5m), 2) wide of area 103.000 ha, 3) Reside in MUBA area (Musi Banyuasin) and OKI (Ogan Komering Ulu), 4) open type Mangrove, brackish and middle, 5) mangrove vegetation type: *Rhizophora* sp., *Sonneratia Alba*, *Bruguiera Cylindrical*, *Cerbera* Sp., *Gluta Renghas*, *Stenochlaena Palustris*, *Xylocarpus Granatum*. *N. fructicans*, 6) Threatened condition in general immeasurable effect of cause factor.
2. Condition of Mangrove in Indonesia in this time: 1) Wide of ¼ world mangrove; ¾ Asian mangrove, 2) found in all archipelago. Island with wide area is Papua, about 1.350.600 ha (38%), Kalimantan 978.200 ha (28%) and Sumatra 673.300 ha (19%), 3) experiencing of pressure effect of resident population height in coastal area region, 4) Decreasing area effect conversion/change of land function 5) condition threatened immeasurable effect of cause factor.
3. Change cause to mangrove vegetation 1) growth of resident which is fast relative 2) mangrove exploiting which only focus at economic factor, 3) change of global climate, 4) Change of is condition of ecosystem in terrestrial, 5) Resident caring of mangrove function still is very low.
4. Its influence to ecosystem in coastal area of South Sumatra east: 1) Degradation/ loss of the source of sea animal protein, 2) Regional stricture of continent, 3) Loss of biodiversity, 4) Make-Up of sea water intrusion, 5) Decreasing of Earnings of fisherman and farming (area coastal society community).
5. Proposal to pattern management of coastal lowland area: 1) Human Resources aspect: change of mind set of human being approach to mangrove ecosystem through education, counseling and training, 2) Institute aspect: and compilation stipulating of regulation peripheral about management pattern and continuation of mangrove, 3) Landscape aspect: settlement, exploiting and allotment according with function it.



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